

[Ikawa, Mitsuru](#)

**On the poles of the scattering matrix for two convex obstacles.** (English) Zbl 0587.35057  
Journ. Équ. Dériv. Partielles, Saint-Jean-De-Monts 1985, No. 1, Exp. No. 5, 14 p. (1985).

This paper is a contribution to the discussion of the relation between the scatterer and the poles of the corresponding scattering matrix. The three-dimensional wave equation in the exterior of two smooth, disjoint, strictly convex obstacles  $O_1, O_2$  under the assumption of a Dirichlet boundary condition is considered. The author not only narrows down the location of the poles considerably but also provides information about the order of the singularity for certain poles. It is shown that the scattering matrix is holomorphic in  $\{z \mid \text{Im } z \leq c_0 + c_1\} - \cup_{j=-\infty}^{\infty} D_j$  where

$$D_j = \{z \mid |z - z_j| \leq C(1 + |j|)^{-1/2}\}, \quad z_j = ic_0 + (\pi/d)^j, \quad d = \text{dist}(O_1, O_2).$$

Moreover, for large  $j$  there is only one simple pole in  $D_j$ . These poles  $\phi_j$  are asymptotically (for large  $j$ ) closer and closer to  $z_j$ , they are simple and there is an asymptotic expansion of the form

$$\phi_j \sim z_j + \beta_1 j^{-1} + \beta_2 j^{-2} + \dots \quad \text{as } |j| \rightarrow \infty$$

where the  $\beta_k$ ,  $k$  positive integer, are complex numbers determined by the obstacle.

Reviewer: [R.Picard](#)

**MSC:**

[35L05](#) Wave equation  
[35P25](#) Scattering theory for PDEs  
[35B65](#) Smoothness and regularity of solutions to PDEs

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**Keywords:**

[scattering matrix](#); [wave equation](#); [obstacles](#); [order of the singularity](#); [asymptotic expansion](#)

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